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The True Place of Astrology in the History of Science

By Lynn Thorndike *

THE true place of astrology in the history of science is a vast subject with countless ramifications which it would take a long time to pursue and many pages to relate. My present purpose is to emphasize a single point, but one which is the most important and fundamental of all. Briefly stated, it is that, during the long period of scientific development before Sir Isaac Newton promulgated the universal law of gravitation, there had been generally recognized and accepted another and different universal natural law, which his supplanter. And that universal natural law was astrological.

One may, of course, employ the words "astrology" and "astrological" in a variety of senses and meanings, and they have often been so employed in times past. One may restrict the terms to the art of, or attempt at, prediction of the entire life of any and every human individual from the hour of his nativity, and dismiss this as an idle superstition. But nativities were only a single branch or department of astrology in the broad sense, and their validity depended upon the underlying assumption that the entire world of nature was governed and directed by the movement of the heavens and the celestial bodies, and that man, as an animal naturally generated and living in the world of nature, was also naturally under their rule. Astrological medicine was an obvious sequel of this assumption and was free from the objection that prediction of man's fate violated freedom of the will.

Huillard-Bréholles interpreted the word, "astrology," in a narrow sense, when he wrote of the emperor, Frederic II, "He believed in astrology to the last hour of his life," although he accounted for that emperor's penchant for astrology by his insatiable thirst for knowledge.¹ But he went on to say that Frederick's astrological speculations were only a branch of mathematics, which larger subject he cultivated "with a sort of passion," and loved to relieve the cares of government by study of the exact sciences.

Aristotle and the astrologers² were agreed that the heavens and celestial bodies were incorruptible and unchanging, that their motion was regular and

* Columbia University.

¹ *Historia diplomatica Friderici Secundi*, VII (1859), dxxxi-dxxxiii.

² The friction between the faculties of arts and of theology at Paris, of which Professor Mary Martin McLaughlin treated in a paper on "Medieval University Masters and Ideas of Intellectual Freedom," at the sixty-ninth annual meeting of the American Historical Association on 28 December 1954, was not merely a matter of difference between a rational and a dogmatic

mode of approach, or of how the works of Aristotle should be taught, but a more fundamental divergence between the supernatural and this universal natural law which was astrological. Of the 219 opinions which were condemned at Paris in 1277, a large number was astrological in one or another sense of that word. This would have proved to be even more true in the case of universities like Padua and Bologna, where the arts course was pre-medical rather than leading on to the study of theology, as it did at Paris.

eternal, circular and perfect, that they were a superior fifth essence distinct from the inferior elemental world of our earth and its atmosphere, where generation and corruption and alteration prevailed, changing seasons of the year and daily weather permutations, geological formation and dissolution, changing sea-coasts and river-beds, earthquakes, volcanoes and floods, growth and decay of vegetation, birth and death of animals.

Moreover, all these processes corresponded to the movements and positions of the heavenly bodies. The stars were not themselves affected by their movement and light, since they were eternal and incorruptible. But their motion and rays had to have some effect, and an outlet for this vast store of energy was found in our elemental world, whose changes and fluctuations and variations paralleled the shifting pattern of the eternal heavens and the varying projection of rays of light and influence thence. Furthermore, the earth was thought of as the center and bottom of the universe, and it was fitting that inferiors should be ruled and governed by superiors — the heavenly bodies. As the concluding sentence of a philosophical manual in a manuscript of the fifteenth century³ put it, "Certain therefore is the influence of the heavens on these inferior bodies." The heavenly bodies were responsible for all meteorological phenomena in the region or regions of air; they caused the tides in the sphere of water; they affected all generation upon earth, and sometimes produced spontaneous generation without sexual intercourse; they formed gems and strata of rocks underground, so that it was the most logical thing in the world to relate seven metals to the seven planets, as was done for centuries.

A special appeal might be made to celestial influence in order to explain the operation of occult virtue, such as that of the magnet. But this should not blind us to the fact that celestial influence was the general and universal cause of all inferior nature. "Coelum per formam suam agit," quoth Duns Scotus.

The most scientific form of weather prediction was astrological, and an abundant literature on the subject, derived from India as well as from the Arabic, instructed one how to forecast rain, winds, and changes of temperature from the movements of the planets — direct, retrograde or stationary — through the twelve signs of the zodiac and the twenty-eight mansions of the moon.

In other cases, it might be possible to arrive at roughly correct and satisfactory conclusions from the observation of terrestrial phenomena as immediate causes, but in such cases too the heavens were the remote and primary cause. This had been the law of nature and the fate of the ancient Stoics. This general rule of the heavens over the world of nature was held by Albertus Magnus and Thomas Aquinas, by Tycho Brahe and Kepler.

More than thirty years ago I wrote with regard to Albertus Magnus:

This general law that the world of nature and of life on this earth is governed by the movements of the stars is expressly repeated again and again in Albert's works, and its truth is assumed even oftener.⁴

I may add now two further specific illustrations from his works of the applica-

³ Vatican Barberini Latin MS 343, fols. 66-80. ⁴ *A History of Magic and Experimental Science*, II (1923), 583.

tion of this law. The figure of a plant imitates the pyramid of celestial light,⁵ and, although living bodies are more highly organized than inanimate things, they also deviate less from the norm and are more closely related to celestial nature than are other material bodies. By their equality of complexion they participate by analogy in the principle of celestial life. That celestial principle has more power over the matter of the body than the body's own corporal form has. Hence the influence of the stars has more effect upon animate creatures than their corporal nature has, and moves them to forms which are not of the elements, nor are their compounds consequences of the elements, but the celestial force works in them not one but many impressions, none of which their corporal nature could effect.⁶ Even in his *Summa theologica*, in discussing the sixth day of creation and the divine command, "Let the earth bring forth the living creature," Albert asked how that could be, "since the power to produce animals is not in the earth, but, according to astronomers, is in the heavens." Ultimately Albert reached the conclusion that, when God said, "*Producat terra*," He designated the earth merely as the material principle from which animals are formed, but that the active principle is the heavens.⁷

This rule of the heavens should be kept constantly in mind by every student of the history of science before Newton in evaluating any aspect of scientific or, for that matter, human activity. Most past critics of what they were pleased to call astrology never questioned this assumption, which was its very basis. They began to do so in the sixteenth and seventeenth centuries, as the distinction between earth and heavens was gradually obliterated, and this led on to Newton's new development. But to hold that natural or physical law was a concept then first inaugurated is to do astrology, in the sense that I have been using the term, and also the previous period, a grave injustice.

As an example of this common misconception may be quoted a passage from Bidney's book on Spinoza in the year 1940:

The characteristic features of Renaissance philosophical thought were the revival of the atomic theory in conjunction with mathematics, and the consequent stress upon the primary importance of the efficient cause as a principle of definition and explanation. Beginning with the experiments of Galileo and his success in measuring the rate of acceleration of falling bodies, the conviction gradually arose that nature as a whole was subject to immutable laws which could be mathematically expressed — a process which Newton brought to a brilliant culmination. In other words, there were universal laws of becoming, laws of change which governed the correlation between particular events. This was an entirely new and seminal idea which was destined to revolutionize the natural sciences.⁸

But surely astrology had for centuries before believed in universal laws which governed particular events, and that nature as a whole was subject to immutable laws.

⁵ *De veget. et plantis*, II, i, 5.

⁶ *Ibid.*, I, i, 1.

⁷ *Op. cit.*, II, xi, 61.

⁸ David Bidney, *The Psychology and Ethics of Spinoza*, 1940, pp. 13-14. Edgar Zilsel, "The

Genesis of the Concept of Physical Law," *Philosophical Review*, 61 (1942), 245-79, dismissed astrology in two or three sentences such as (p. 252) "In the astrological literature of late antiquity sometimes laws of nature are mentioned in an entirely magical sense."

Modern historians of science have been strangely blind to the fundamental and universal importance of this sweeping, all-inclusive hypothesis, that all operations of the inferior world of nature spring from and are controlled by the eternal movement of the incorruptible celestial bodies. Strangely blind also to its supreme significance in the appreciation and comprehension and evaluation of pre-Newtonian scientific thought and activity! A few, however, have come close to the realization of this. George Sarton, in one passage in his monumental *Introduction to the History of Science*, comes close to recognizing it, when he writes of Roger Bacon:

He was deeply interested in astrology, in which he believed implicitly. . . Astrology itself he divided into two kinds; a legitimate kind, and a forbidden one, mere superstition. This was very sound, in spite of the fact that much if not all of Bacon's legitimate astrology was nothing but error and superstition from our point of view.⁹

In another passage Sarton says:

However, Bacon's thoughts did not dwell so much on statics as on dynamics. He was pondering on the nature of force, especially on force or action at a distance. Curiously enough, these thoughts, earnest as they were, were partly astrological. For among the forces or actions considered by him were light and gravity, but also astrological influences, the reality of which were beyond doubt. How were these astrological influences transmitted across the open spaces? How were these distant causalities propagated? It was very remarkable to ask such questions. and we must not blame him for failing to solve them.¹⁰

On this second passage our comment must be that there was nothing curious about Bacon's thought; it was quite logical and natural. Nor was it very remarkable to ask such questions. Rays of light and of astrological influence were propagated from the same heavenly bodies in accordance with the natural law of the universe, the causation of inferiors by superiors.

Mark Graubard has recently written of astrology not as a past superstition but as a fossil science.¹¹ Yet he does not seem to realize that it depended upon a once generally accepted hypothesis of universal natural law.

Such a law is tacitly or virtually admitted in many a passage in A. C. Crombie's *From Augustine to Galileo: the history of science, A.D. 400-1650*. At page 9 he speaks of "astrological interpretation of the world of nature as a whole"; at pages 35-36, he says, "'Celestial virtue' was admitted as a cause by nearly all the Latin writers of the 13th century"; at page 40 we read, "From the four elements were produced, under the influence of the celestial spheres, plants, animals and man himself"; at page 95 he states that Ristoro d'Arezzo "was very astrological. He attributed the elevation of dry land above the sea to attraction by the stars"; at page 122 we learn that Arabic writers and Latin schoolmen "generally supposed that such forces" (of generation) "were supplied by celestial virtue." But the basic generalization towards which these scattered passages point is not brought out, and sometimes astrology is spoken of as a superstition which the more enlightened made fun of.¹²

⁹ *Op. cit.*, II, 956.

¹⁰ *Ibid.*, II, 763-64.

¹¹ *Astrology and Alchemy, Two Fossil Sciences*, New York, 1953.

¹² *Op. cit.*, pp. 8-9.

Bally-hooers for the uniqueness of modern science have further repeatedly insisted that mathematical method was then first applied to the investigation of natural phenomena. Francis Bacon, with his inductive method, has been sharply criticized for his neglect of mathematical method. I hold no brief for poor old Francis. But give me leave to say that astrology certainly applied mathematical method to natural phenomena. Geometry and trigonometry, sines and chords, were needed to trace the courses and to find the positions of the planets. The *Almagest* of Ptolemy was primarily mathematical in its method, nor were its mathematics of an easy sort. In astrology, furthermore, timing was of utmost importance. Tables were carried not merely to minutes and seconds, but thirds and even farther. The projection of rays and problems of reflection and refraction were as much the concern of astronomy and astrology as they were the concern of perspective and optics. Regiomontanus has been called the first modern mathematician. But he was not the first to draw up tables of astrological directions. All the observations and measurements of the stars, all the devising of astronomical instruments, all the calculation of astronomical Tables, were motivated by the urge to implement the universal law of nature in the service of humanity.

In previous periods astrology and astronomy had regarded themselves as far superior to physics and mechanics. Newton's *Principia* destroyed the age-long distinction between superiors and inferiors. The astrological wings of high-flying science melted; it fell back to earth and became terrestrial. But this change came about slowly. The Jesuit, Menestrier, writing in 1694 seven years after the publication of Newton's *Principia*, while attacking engraved astrological images and the belief in the stars as particular causes, yet had no doubt that they were general causes of all inferior nature. Moreover, the new Newtonian physics did not affect biology and medicine, which had to wait for the doctrine of evolution, whereas the astrological hypothesis had been a universal law for them too.

Herbert Dingle, in a paper read last year at the Seventh International Congress of the History of Science at Jerusalem, upon "The Essential Elements in the Scientific Revolution of the Seventeenth Century," held that the object of all science is

. . . the detection of regularities in our experience and the expression of those regularities in the simplest and most comprehensive rational form.

Such regularity had been the aim, the ideal, the boast and the assumption of astrology. Dingle further argued that

It is reasonable to look forward to the time when all the sciences will be fused into a single science, using a single set of concepts, though that time may yet be distant.

If we may look forward to such a unified science, we may also look backward to it, before the seventeenth century, to the time when all change and all

phenomena in the elementary world were believed to be governed by the radiations of the eternal and incorruptible, yet moving, celestial spheres.¹³

¹³ It should hardly be necessary for me to state that I do not share this belief or have any faith in the methods of astrology. I further recognize that the rule of all terrestrial nature by the movements and influence of the heavenly bodies was not a law in the modern sense of being mathematically demonstrable. My pur-

pose has been merely to emphasize that this belief was generally held by scientists and by mankind at large for centuries, and should be taken into account by every historian of that period.

This paper was first presented at the annual meeting of the History of Science Society, on 30 December 1954.

• NOTES & CORRESPONDENCE •

The Critical Bibliography

The last issue of *Isis* contains the Eightieth Critical Bibliography. The Eighty-first is in the process of preparation, and will be published at the end of the year. All readers of *Isis* are urgently requested to send reprints or tear-sheets of articles and book reviews dealing with the history of science and its cultural influences to the editor, I. Bernard Cohen, Widener Library 189, Cambridge 38, Mass., so that they may be included. When relevant articles appear in *Festschriften* or other works from which reprints are not available, it would be helpful if full bibliographical citations might be sent.

I. B. C.

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Current Work in the History of Medicine

The Wellcome Historical Medical Library has undertaken the listing of current periodical literature dealing with the history of medicine. A permanent cumulative subject index to all historical papers dealing with or relating to medicine is being established at the Wellcome Library. It has seemed to the editors a useful extension of this service to medical historians to plan the issuing from time to time of an index to papers which have already appeared. Three lists have thus far appeared, each covering a quarterly period, the most recent one, July-September, 1954. In the first list, articles have been listed under two sets of classification, the first according to subject (e.g., alchemy, anaesthesia, anatomy, 15th century, 16th century . . . biochemistry, blood, cancer, critical days . . .), and the second, according to person

(each article being listed under the name of the individual to whom it is devoted). The most recent number contains one master subject index, in which medical topics and medical men are combined. An unusual feature is a list of authors and addresses for each citation, and a list of the periodicals indexed. The third number also contains a complete author index to the first three numbers.

One especially useful feature of this valuable publication is the adoption of the *World List of Scientific Periodicals*' system of abbreviation. It would be most helpful if all bibliographical citations in the history of science and of medicine could make this a universal system.

In hailing this new publication, we wish it a long and useful life, and congratulate the editor, F. N. L. Poynter, upon it. Mr. Poynter says that "interested persons may write to be put on our mailing list, and of course we should be very glad to receive any reprints on the history of medicine and also to have any information about forthcoming books."

Mr. Poynter's splendid *Catalogue of the Incunabula in the Wellcome Library* is reviewed in the Eightieth Critical Bibliography in the previous issue of *Isis*. Mr. Poynter informs me "that the first volume of the General Catalogue, which includes books printed before 1640, is now in press and should be out next year. It contains about 10,000 items."

I. B. C.

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Annual Meeting, Section L, A.A.A.S.

From 28 through 30 December 1955, Section L, History and Philosophy of Science,